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Landbird Inventory of the Pinnacles National Monument

A Final Report to the National Park Service
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EXECUTIVE SUMMARY

Biologists from PRBO Conservation Science conducted an inventory of the landbirds that occur in the Pinnacles National Monument during 2001 and 2002. The initiation of this project followed the National Park Service identifying birds as a component of ecosystems that should be identified and monitored. The focus of this inventory was the recently acquired lands of the monument, to augment the earlier systematic survey of birds in the pre-existing portion of the monument, conducted in the mid-1980s (Avery and Van Riper 1986). As part of this inventory we established and analyzed data from nine point count transects totaling 92 stations during the breeding season. Data were collected from 57 stations in 2001 and from 35 stations in 2002. Point count transects were established in three major habitat types: chaparral, pine-oak woodland, and riparian woodland, after the approach used in the earlier survey. Additionally, 24 area search plots were established and surveyed to augment the point count data and inventory winter landbirds. Seventeen of these plots were surveyed during winter of 2001/2002, and seven were surveyed during the breeding season of 2002. Our goal of surveying 80 to 90% of the breeding birds within the newly acquired lands of the monument was assessed using a cumulative species function, which analyzed the rate at which new species were detected as additional points were added, and the coverage was deemed sufficient.

Various population parameters for each habitat were obtained from point count data, including species diversity, richness, and relative abundance. A total of 99 species were detected in the Pinnacles National Monument. Riparian woodland had the highest species diversity and richness, and had the highest number of both non-breeding migrants and breeding species. The most common species included Black-headed Grosbeak, House Wren, Nuttall's Woodpecker, Song Sparrow and Warbling Vireo. Pine-oak woodland was medium in terms of population indices. Species in highest abundance in this habitat type included Oak Titmouse, Bewick's Wren and Western Scrub-jay. Chaparral habitat was least rich in terms of non-breeding Neotropical migrants and breeding birds, although abundances were highest here for several species, including Blue-gray Gnatcatcher, California Thrasher, Costa's Hummingbird, and Sage Sparrow.

The development of a monitoring program was to follow the Pinnacles National Monument inventory. Within this document we include many specific research and monitoring recommendations resulting from this project and from discussions with park personnel. More general monitoring recommendations, focusing on priorities at different levels of funding, will be provided within a separate monitoring plan for the San Francisco Bay Area Park Network.

INTRODUCTION

The Pinnacles National Monument is an important conservation area in the central coast region of California. The park, which straddles both Monterey and San Benito Counties, contains over 24,000 acres of arid and semi-arid habitat, and is home to large areas of undisturbed chaparral and woodland habitat as well as riparian corridors. These habitats provide critical habitat for central coast avifauna and other wildlife. Due to its protected status and the quantity, quality, and variety of habitats encompassed by the National Monument, the Pinnacles offers a unique opportunity for bird inventory and monitoring studies in the central coast.

In 1996, the National Park Service identified birds as a component of ecosystems that should be identified and monitored. The first systematic bird inventory was conducted in 1983-1985 (Avery and Van Riper 1986), and these surveys were repeated in 1997-1999 (Buranek and Fesnock 1999). In 2000, approximately 8000 acres of land were added to Pinnacles National Monument by presidential decree. Little was known about these new areas, and plant and wildlife inventories were identified as immediate needs. In 2001, PRBO Conservation Science began an inventory of the avifauna in the recently acquired lands of the monument, as well as in some historic areas not previously surveyed, with special attention to bird-habitat associations and to birds which breed within the new park boundaries. PRBO had completed similar inventories within Lassen Volcanic National Park (Flannery et al. 2000), Point Reyes National Seashore, and Golden Gate National Recreation Area (Humble et al. 2000). To this end, and to compliment the existing data from the interior of the park, we established nine point count transects containing 92 points covering the three major habitat types within the park: chaparral, pine-oak woodland, and riparian woodland. This coverage was designed to provide information on the species richness, diversity, abundance, distribution and habitat associations of landbirds breeding within the newly acquired lands of the park.

The goals of this project were (1) to document the occurrence of 80% (preferably 90%) of breeding landbirds within newly acquired monument land, describe their habitat

associations and provide a park inventory, (2) to document species richness, diversity, abundance, and distribution within the park, and (3) to provide recommendations for a long-term monitoring plan for landbirds in the park.

METHODS

Point Counts

The point count method is one of the most efficient and data-rich methods of monitoring landbird populations available (Ralph et al. 1995). Point count data are used to calculate secondary population parameters, such as diversity, abundance, and species richness. Nine variable circular plot point count transects with a total of 92 points were established throughout the Pinnacles National Monument to inventory park bird species (Table 1; Appendix A). Transect sites were selected based on several criteria: accessibility, habitat type, and past coverage. The intent was to survey lands never systematically surveyed before, and therefore areas already inventoried were not re-sampled. Points along transects were located not less than 250 meters apart, to reduce the possibility of counting individual birds more than one time per census. Transects were placed at least 50 meters from main roads, and tended to be placed along pre-existing trails because of the density and inaccessibility of off-trail areas. Points along transects were marked with flagging tape and UTM coordinates were collected with handheld GPS units for mapping and future resighting.

The point count method relies heavily on detecting birds by sound. Because of this, and because the method is based on the assumption that birds are territorial and do not move great distances in short periods of time, point counts are best used for surveying songbirds, which tend to have relatively small, fixed territories, during the breeding season (approximately April – July in coastal California). Each transect was surveyed two or three times during the breeding seasons of 2001 and 2002. Surveys began within 15 minutes of local sunrise, and ended not more than four hours thereafter to capitalize on high bird activity during the morning hours. During a survey, a trained observer stood at a fixed point and recorded all detections of birds within a five-minute period. During that time, each bird detected was recorded either as singing, as a visual sighting, or as calling,

in that hierarchical manner. The distance of each bird from the observer was recorded in the following manner: each bird detected was categorized as being detected between 0 and 10m, 10-20m, 20-30m, 30-40m, 40-50m, 50-75m, 75-100m or greater than 100m from the observer. Birds that flew over the point without landing were recorded in a separate category. This method was comparable to those used in the previous standardized surveys of Pinnacles National Monument (Avery and Van Riper 1985, Buranek and Fesnock 1999)

Six point count transects with a total of 57 points were established and surveyed in 2001 (Table 1). These transects were visited three times during the breeding season, between May and July. After determining that all three major habitat types required additional sampling to increase species coverage to the goal of inventorying 80-90% of the species in the park (see Assessing Sufficient Habitat Coverage, below), three additional transects were added in 2002. These transects, with a total of 35 points, were North Wilderness Trail 1 (NWTR), North Wilderness Trail 2 (NOTR), and South Wilderness Trail (SWTR). Each transect was visited two times between June and July in 2002. Refer to Table 1 for a complete list of transects, number of points, habitat types, and dates visited.

Table 1. Point count transects, number of points on each transect by habitat type and cumulative, and the dates that these transects were visited. CH, PO, and RW columns indicate the number of points within each major habitat type, where CH=Chaparral, PO=Pine-oak Woodland, and RW=Riparian Woodland. Tot. Pts. = total number of points per transect.

Transect	Full Name	CH	PO	RW	Tot. Pts.	Visit 1	Visit 2	Visit 3
GRCA	Grassy Canyon	0	3	4	7	5/7/01	5/30/01	6/21/01
MCCA	McCabe Canyon	0	10	0	10	5/7/01	5/30/01	6/17/01
NCPE	North Chalone Peak	6	2	0	8	5/7/01	5/30/01	6/17/01
NOTR	North Wilderness Trail 2	1	9	0	10	6/15/02	6/30/02	
NWTR	North Wilderness Trail 1	11	3	0	14	6/9/02	6/30/02	
SCPE	South Chalone Peak	10	0	0	10	5/7/01	5/30/01	6/17/01
SWTR	South Wilderness Trail	2	1	8	11	6/8/02	6/23/02	
UPCH	Upper Chalone Creek	6	0	6	12	5/8/01	5/21/01	6/20/01
WFCC	West Fork Chalone Creek	0	0	10	10	5/8/01	5/21/01	6/20/01
Total		36	28	28	92			

Area Searches

The area search method is a technique for surveying songbirds that can be complementary to point counts. An advantage of the area search method is that, unlike the point counts, the observer is free to move about the plot and actively seek out birds that may be quiet, hidden, or otherwise go undetected using the point count method. Further, because the area search method does not rely as heavily as point counts upon detecting birds by song, it can be used to survey birds during the fall and winter seasons. In summary, an area search plot of approximately 3 hectares is surveyed for a 20-minute period. Plots are placed entirely within one habitat type. During the 20-minute survey period, the observer may walk about the plot, searching out birds. For each bird that is encountered, the observer records species and type of detection (singing, visual, calling, in that hierarchical order). In addition any breeding, foraging or flocking behavior is noted. Due to the brevity of the area search method, multiple plots may be surveyed within a given morning. Further details of the area search method may be found in Ralph et al. (1993).

Table 2: Area search sites, number of plots by habitat type and cumulative, and dates that sites were visited. The CH, PO, and RW columns indicate the number of plots within each major habitat type, where CH= Chaparral, PO = Pine-oak Woodland, and RW = Riparian Woodland. Tot = total number of plots per site.

Plot	Full Name	CH	PO	RW	Tot	Visit 1	Visit 2	Visit 3
Winter Area Search Plots								
GRCA	Grassy Canyon	0	2	1	3	12/8/01	1/19/02	2/8/02
MCCA	McCabe Canyon	0	4	0	4	12/7, 12/8/01	1/19/02	2/8/02
NCPE	North Chalone Peak	2	0	0	2	1/18/02	2/7/02	
SCPE	South Chalone Peak	2	0	0	2	1/18/02	2/7/02	
UPCH	Upper Chalone Creek	1	0	2	3	12/9/02	1/18/02	2/7/02
WFCC	West Fork Chalone Creek	0	0	3	3	12/9/01	1/18/02	2/7/02
Breeding Season Area Search Plots								
BEGU	Bear Gulch	2	1	1	4	6/8/02	6/22/02	
WEEN	West Entrance	0	2	1	3	6/22/02	6/30/02	
Total Number of Plots		7	9	8	24			

Area searches were conducted in the winter of 2001/2002 along point count transects established in 2001. In total, 17 area search plots were established and surveyed three

times in the winter of 2001/2002: 5 in chaparral habitat, 6 in pine-oak woodland, and 6 in riparian woodland (Table 2 and Appendix B). Seven area search plots were also established and surveyed once during the 2002 breeding season near the visitor's centers at both the east and west entrances of the park: two in chaparral habitat, three in pine-oak woodland, and two in riparian woodland. These latter plots were surveyed in addition to point count routes on a given day for the purpose of augmenting the park breeding bird list, and not for long-term monitoring purposes. Results from winter area searches were also not analyzed statistically (due to some inherent challenges to doing so), but were used to inventory species that only winter in the monument. These surveys were also to compliment earlier winter work conducted within the pre-existing boundaries of Pinnacles National Monument.

Vegetation Assessment

Transects of points were set up in chaparral, pine-oak woodland, and riparian woodland habitat. Vegetation was classified into a general habitat types based on the dominant vegetation type within a 50-meter radius of each point count station. Although vegetation and dominant tree and shrub species varied within a habitat type, we felt that these general habitat descriptions were sufficient to begin an understanding of the distribution of species within habitat types in the park.

Vegetation data in a 50m radius around each point count station were collected using the relevé method described by Ralph et al. (1993). General habitat characteristics of each point count station were recorded (maximum and minimum tree diameter at breast height, canopy cover, aspect). The cover, abundance, and height of each vegetation stratum (tree, shrub, and herb) was estimated. In addition, the species composition of each stratum, as well as the relative percentage that each species of a layer comprised was recorded.

Statistical Analysis

As mentioned above, the point count method is based on the assumption that, during the breeding season, birds have relatively small, fixed territories. Some species encountered,

however, have either very large territories (for example, many raptors) or are non-territorial apart from an extremely limited area around their nest site (for example, swifts and swallows). To avoid biased results due to overcounting such individuals, we eliminated species from analysis which are not well surveyed by the point count method, including swifts, swallows, crows, ravens, waterfowl, wading birds, shorebirds, raptors and owls, regardless of breeding status within the park. Because the detectability of birds in most habitats decreases dramatically past 50 meters from the observer, only birds detected within 50 meters of each point were included in analysis of point count data, except for the purpose of creating a park bird list.

Point count data were analyzed for species diversity, richness, and overall abundance by point. A by-point analysis (as opposed to a cumulative analysis) allows for more appropriate comparisons between transects and habitat types when the number of visits or the number of points varies between transects or habitats, as was the case in this study. The third visit to sites surveyed in 2001 was dropped for analysis, in order to more easily compare results. The third visit was chosen because, as it was visited later in the breeding season when bird activity tended to be lower, it tended to have fewer observations than earlier visits. Population indices (species diversity, richness and abundance) for each point were then sorted and averaged by habitat and by transect for presentation in this report.

Species diversity measures ecological diversity based on the number of species detected within a 50-meter radius, weighted by the number of individuals of each species found within that 50-meter radius. A high score indicates high species diversity. We measured species diversity using a transformation of the usual Shannon-Wiener index (MacArthur 1965). The advantage of this transformation over the original Shannon-Wiener metric is that it is measured in terms of species instead of bits of information, and thus is more easily interpretable. Average species richness, or the average number of species detected per point per habitat or transect, as well as cumulative species richness, the total number of species detected per habitat or transect (within a 50m radius), as well as the average abundance of all individuals detected (by habitat and transect), were also calculated.

Assessing Sufficient Habitat Coverage

We assessed the likelihood that we had achieved our goal of documenting 80% (and preferably 90%) of the species breeding in the park by writing and using a cumulative species function program written by PRBO. This program extrapolates the rate at which new species are encountered as point count stations are added within a given habitat. Only detections of less than 50m were used in this analysis. The program uses randomly selected subsets of the points in given habitats in a bootstrap approach run 1000 times. Means of the points and slopes required to reach 80% of species detected in a given habitat and 95% confidence intervals were generated. We used this program to determine if a sufficient percentage of the avifauna present were likely detected. We ran the program after the 2001 inventory to determine if additional points were needed in any of the habitats and after the 2002 season to ascertain the completeness of the inventory.

RESULTS AND DISCUSSION

A total of 99 species were detected in the Pinnacles National Monument between spring of 2001 and summer of 2002 using both point counts and area searches (Appendix B). Of those species, 60 were found in chaparral habitat, 68 in pine-oak woodland, and 74 in riparian woodland. Riparian woodland had the highest numbers of both non-breeding migrant species (13) and breeding species (26), while chaparral was the least rich in terms of both migrants (7) and breeding birds (16). Table 3 provides a breakdown of species numbers by habitat and breeding status. Summary statistics for point counts by habitat and by transect are found in Tables 4 and 5, including diversity indices, average and cumulative species richness, and indices of abundance. No single statistic provides a clear picture of the bird community; they must be examined in combination.

Table 3. Number of species detected in each habitat surveyed using both point counts and area searches, sorted by breeding status, where 0= migrant or winter resident, 1= unlikely breeder within specific habitat type, 2= probable breeder within habitat type, 3= breeder within habitat type, based on point count detections, and 4= confirmed breeding status (species observed breeding within habitat type).

Habitat	Number of Species By Breeding Status				
	0	1	2	3	4
Chaparral	7	25	12	8	8
Pine-Oak Woodland	1	23	13	9	15
Riparian Woodland	13	24	11	17	9

Table 4. Summary statistics for bird species detected by point counts by habitat. Avg. Diversity is the mean of the transformed Shannon-Wiener diversity index for all points per habitat type, Avg. Richness is the mean number of species detected per point by habitat type, Cumulative Richness is the total number of species detected in each habitat type, and Avg. # Individuals is the mean number of individuals detected per point in each habitat type. Species total is the total number of species detected per habitat, using both point count and area search results. Average and cumulative statistics were calculated using the first two visits of the 2001 and 2002 seasons, combined.

Habitat	# Points	Avg. Diversity	Avg. Richness	Cumulative Richness	Avg. # Individuals	Species Total
Chaparral	36	7.24	8.06	45	13.75	60
Pine-oak Woodland	28	9.90	11.71	42	24.39	68
Riparian Woodland	28	11.73	13.11	56	22.29	74

Table 5. Summary statistics for bird species detected by point count transect. Average and cumulative statistics were calculated using the first two visits of the 2001 and 2002 seasons, combined. Avg. Diversity is the mean of the transformed Shannon-Wiener diversity index for all points in each transect, Avg. Richness is the mean number of species detected per point in each transect, Cumulative Richness is the total number of species detected per transect, and Avg. # Individuals is the mean number of individuals detected per point per transect.

Transect	Full Name	# Points	Avg.		Cumulative	Avg. #
			Diversity	Avg. Richness	Richness	Individuals
GRCA	Grassy Canyon	7	10.48	11.71	34	18.86
MCCA	McCabe Canyon	10	8.74	10.5	35	20.1
NCPE	North Chalone Peak	9	5.94	6.38	24	8.38
NOTR	North Wilderness Trail 2	10	13.54	15.7	32	34.9
NWTR	North Wilderness Trail 1	14	7.37	8.29	26	15.29
SCPE	South Chalone Peak	10	5.98	6.7	22	11.4
SWTR	South Wilderness Trail	11	14.36	17	46	35.91
UPCH	Upper Chalone Trail	12	7.63	8.25	35	12
WFCC	West Fork Chalone Creek	9	10.98	12.1	34	18.6

Bird and Habitat Relationships

Chaparral (36 points, mean diversity 7.24, mean richness 8.06, mean abundance 13.75)

Chaparral habitat, dominated by chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos* sp) and buckbrush (*Ceanothus cuneatus*) had the lowest mean bird diversity, richness and abundance per point, despite being the most sampled habitat in the park. Species of highest abundance in this habitat were Bewick's Wren (*Thryomanes bewickii*), Spotted Towhee (*Pipilo erythrophthalmus*), and Wrentit (*Chamaea fasciata*). Eight species were more abundant in chaparral habitat than in any other habitat, including Bewick's Wren, Blue-gray Gnatcatcher (*Poliioptila caerulea*), California Thrasher (*Toxostoma redivivum*), Costa's Hummingbird (*Calypte costae*), and Sage Sparrow (*Amphispiza belli*). This was the only habitat in which the migrant Allen's Hummingbird (*Selasphorus sasin*) was detected.

Pine-oak Woodland (28 points, mean diversity 9.90, mean richness 11.71, mean abundance 24.39)

Pine-oak woodland habitat was dominated by blue oaks (*Quercus douglasii*) and gray pines (*Pinus sabiniana*), although other oak species occurred. The understory of these

woodlands tended towards grasses and occasional shrubs such as buckwheat (*Eriogonum* sp). The population indices obtained for pine-oak woodland were intermediate between chaparral and riparian woodland, with the exception of mean abundance per point, which was highest in this habitat. Oak Titmouse (*Baeolophus inornatus*), Bewick's Wren, Western Scrub-jay (*Aphelocoma californica*), Spotted Towhee, and California Quail (*Callipepla californica*) were among the most abundant species in this habitat. Several species were found in highest abundances in pine-oak woodland, including Ash-throated Flycatchers (*Myarchus cinerascens*), Bushtit (*Psaliparus minimus*), California Quail, Hutton's Vireo (*Vireo huttoni*), Oak Titmouse, Phainopepla (*Phainopepla nitens*), Rufous-crowned Sparrow (*Aimophila ruficeps*), and Western Scrub-jay. Two species were encountered here that were not found in any other habitat type: Hairy Woodpecker (*Picoides tridactylus*) and Lewis's Woodpecker (*Melanerpes lewis*).

Riparian Woodland (28 points, mean diversity 11.73, mean richness 13.11, mean abundance 22.29)

Riparian woodland was found primarily along Chalone Creek and associated forks. Dominant tree species included Fremont cottonwood (*Populus fremontii* ssp *fremontii*), various willow (*Salix* sp) and oak (*Quercus* sp) species and western sycamore (*Platanus racemosa*). The understory of this habitat tended to be dense and diverse, and was often characterized by scrub willows, Durango root (*Datisca glomerata*), and various other fast-growing annuals. Riparian woodland ranked highest in terms of mean species diversity and richness per point, and was only slightly lower than pine-oak woodland in mean abundance per point. Eleven species, more than any other habitat type, were found in highest abundances in riparian woodland. These species included Black-headed Grosbeak (*Pheucticus melanocephalus*), House Wren (*Troglodytes aedon*), Lesser Goldfinch (*Carduelis psaltria*), Nuttall's Woodpecker (*Picoides nuttallii*), Pacific-slope Flycatcher (*Empidonax difficilis*), Song Sparrow (*Melospiza melodia*), Warbling Vireo (*Vireo gilvus*), and Western Wood-pewee (*Contopus sordidulus*). Further, 10 species, including many migrants, were only detected in riparian woodland habitat: Canyon Wren (*Catherpes mexicanus*), Chestnut-backed Chickadee (*Poecile rufescens*), Cooper's Hawk (*Accipiter cooperii*), Downy Woodpecker (*Picoides pubescens*), Lark Sparrow

(*Chondestes grammacus*), Lazuli Bunting (*Passerina amoena*), Rock Wren (*Salpinctes obsoletus*), Steller's Jay (*Cyanocitta stelleri*), Swainson's Thrush (*Catharus ustulatus*), and Western Tanager (*Piranga ludoviciana*). Several species, including Canyon Wren and Rock Wren are not riparian associated species, and it is likely that their detection exclusively in riparian woodland is due to a combination of two factors: first, that their preferred habitat of rocky scree slopes was not sampled by point counts, and second, that these species were attracted to standing water and moisture in an otherwise arid landscape.

Assessing Sufficient Habitat Coverage

The results from the cumulative species function program indicate that our coverage of chaparral, pine-oak woodland, and riparian woodland habitats within the Pinnacles National Monument met the 90% detection criterion (Table 6). For all three habitats, the 80% mark was reached after approximately half of the points within each habitat had been surveyed. 100% of all species detected in each habitat were detected before the final point was surveyed. The rate at which new species were detected as more points were added (the average slope) was less than one for all habitats at both the 80% and the 100% species detection mark, meaning that less than one new species was detected per new point established.

Table 6. Assessment of sufficient habitat coverage of chaparral, pine-oak woodland, and riparian woodland habitat in the Pinnacles National Monument (mean±95% confidence interval).

Habitat	# Pts	# Pts at Which 80%	# Pts at Which 100%	Avg. Slope	Avg. Slope
		Species Detected	Species Detected	80%	100%
Chaparral	36	18.55±0.2609	33.72±0.1605	0.56±0.0153	0.52±0.0150
Pine-Oak Woodland	28	10.04± 0.1634	25.44± 0.1582	0.63± 0.0160	0.49± 0.0198
Riparian Woodland	28	13.65± 0.1845	26.68± 0.1007	0.64± 0.0160	0.55± 0.158
All habitats combined	92	36.5±0.5097	86.04±0.3618	0.47±0.0176	0.38±0.0167

Monitoring and Research Recommendations

The following specific monitoring and research recommendations are based on discussions of priorities initiated at the Pinnacles "Vital Signs" Workshop held September 18-20, 2001 and continued by PRBO and NPS staff, as well as on the inventory detailed herein. More general monitoring recommendations, focusing on priorities at different levels of funding and staff availability, will be provided within a separate document: the monitoring plan for the San Francisco Bay Area Park Network (Gardali et al. in prep).

The rich and diverse natural environment of Pinnacles hosts habitats identified by California Partners in Flight as critical to landbirds (<http://www.prbo.org/calpif/>). We suggest the implementation of a long-term landbird monitoring plan that will enable park biologists to detect changes in bird populations and address vital research questions in order to make informed management decisions.

- Continue long-term monitoring of a subset of the existing 92 points established for this study, as well as a subset of the 66 points established by park personnel prior to this study, across the three habitats surveyed.
- Expand point coverage to include rocky scree and cliff habitats within the park in order to monitor populations of cliff-associated species, such as Canyon Wren (*Catherpes mexicanus*) and White-throated Swift (*Aeronates saxatalis*). These species may be impacted by park visitor activity, particularly rock climbing.
- Conduct nest searching and monitoring in major habitat types to directly determine productivity and habitat quality for species breeding within park boundaries (protocol according to Martin & Geupel 1993 and Ralph et al. 1993). Information on species abundance and diversity may not indicate the quality of reproductive habitat (Rogers et al. 1997), and for this reason studies of nest success are critical to understanding bird population dynamics.
 - There are several species that we suggest as focal species for nest monitoring studies. These species were chosen for one or more of the following reasons 1) nests of the same species are found in numbers in

other PRBO nest plots throughout the state, and data may be compared between sites, and 2) the suggested species is closely associated with either chaparral, oak woodland, or riparian woodland, and as such its nest success may serve as an indicator of habitat quality. These species, their nest type (open cup nests are most vulnerable to predation and parasitism, while cavity nests are the most secure), and their major habitat association within the park can be found in Table 7.

- We suggest a nest search study design that allows for the examination of the direct effects of feral pigs (*Sus scrofa*) on breeding birds. The potential to pioneer a study examining the effects of feral pigs on breeding bird populations in the park is great, as pigs will be excluded from approximately 14,000 core acres of the park by pig fencing. Such a study should focus on species that build open-cup nests either on or near the ground level, where pigs forage. Although feral pigs have been shown to have a negative impact on bird populations and nesting success elsewhere (Howell & Webb 1989, Dunn 1992), to our knowledge no published studies have examined the impacts of feral pigs on nesting landbirds in North America.
- Target surveys to determine breeding status for sensitive or chaparral-dependent species: Common Poorwill (*Phalaenoptilus nuttallii*), Greater Roadrunner (*Geococcyx californianus*), and Lewis' Woodpecker.
- Run mist-netting stations during the breeding season in all three major habitat types. Long-term mist netting data provide information on bird population productivity and survivorship, and can be a useful tool in detecting changes in bird populations. We recommend implementing stations using modified MAPS (Monitoring Avian Productivity and Survivorship) protocols, increasing effort as much as possible above the standard of once every ten days. These mist-netting stations also have the potential to serve as public education and outreach sites.

Table 7. Suggested focal species for future nest monitoring studies. Nest Type refers to the type of nest each species builds (C= cavity nest, O= open-cup nest), and Habitat Association refers to the primary habitat that those species breed in within park boundaries (CH= chaparral, PO= pine-oak woodland, and RW= riparian woodland). Habitat Association, when there is more than one, is ranked in terms of importance.

Species	Nest Type	Habitat Association
Ash-throated Flycatcher	C	PO, RW
Black-headed Grosbeak	O	RW
Blue-gray Gnatcatcher	O	CH, PO
California Thrasher	O	CH
Greater Roadrunner	O	CH
Nuttall's Woodpecker	C	PO, RW
Oak Titmouse	C	PO, RW
Phainopepla	O	CH
Sage Sparrow	O	CH
Song Sparrow	O	RW
Spotted Towhee	O	All
Yellow-breasted Chat	O	RW
Warbling Vireo	O	RW
Western Bluebird	C	PO
Western Wood-pewee	O	WO, RW
White-breasted Nuthatch	C	WO
Wrentit	O	CH

PERSONNEL

In 2001 this project was coordinated by PRBO biologists Sandy Scoggin and Missy Wipf. 2001 point counts and vegetation assessments were conducted by PRBO biologists Moe Flannery, Jill Harley, Diana Humple, Cody Martz, Sandy Scoggin, Diana Stralberg, and Missy Wipf, with assistance from volunteers Alex Rose and Andrew Rush. Moe Flannery and Missy Wipf coordinated area searches in the winter of 2001/2002, which were conducted by Roy Churchwell, Miguel Demeulemeester, Moe Flannery, Alison King, Chris Rintoul, Missy Wipf and Aja Woodrow. In 2002 Tonya Haff was the project coordinator. Point counts and vegetation assessments were conducted by Ryan DiGaudio and Tonya Haff. Data preparation and analysis was done by Tonya Haff with assistance

from Diana Humple and Missy Wipf. Computer programs used to manage and summarize data were created by PRBO staff biologists Grant Ballard and Mike Lynes. This project was carried out under the guidance of PRBO's Terrestrial Program Director Geoffrey Geupel.

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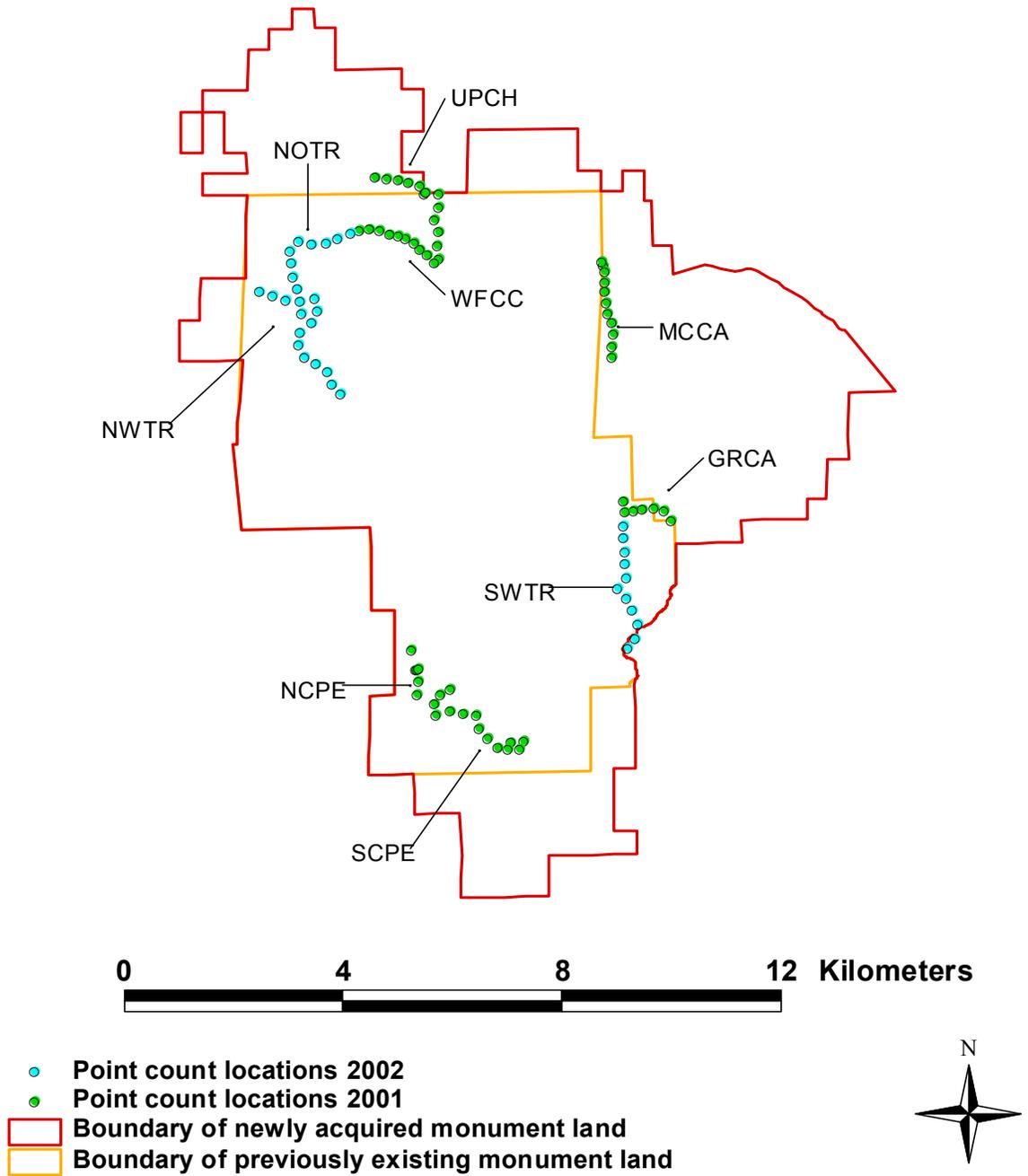
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Appendix A. Point count station locations within Pinnacles National Monument, PRBO 2001-2002.



Appendix B: Species list for the Pinnacles National Monument, based on point counts and area searches conducted from the spring of 2001 through the summer of 2002. Species are listed in alphabetical, not taxonomic order. The numbers in each column refer to the breeding status the species in each habitat, where, 0= migrant, 1= unlikely breeder within specific habitat type, 2= probable breeder within habitat type, 3= breeder within habitat type, based on point count detections, 4=confirmed breeding status, (species observed breeding), 5= winter resident.

Species	Habitat ¹			Season Detected ²	
	CH	PO	RW	W	Br.
Acorn Woodpecker	1	4	2	X	X
Allen's Hummingbird	0				X
American Crow	2		1		X
American Goldfinch			5	X	
American Kestrel	1	4	1	X	X
American Robin		1	3	X	X
Anna's Hummingbird	3	3	3	X	X
Ash-throated Flycatcher	3	4	3		X
Barn Owl		1			X
Black-chinned Hummingbird			1		X
Belted Kingfisher			1		X
Bewick's Wren	3	3	3	X	X
Blue-gray Gnatcatcher	3	4	2		X
Brown-headed Cowbird	1	4	2		X
Black-headed Grosbeak	2	4	4		X
Black Phoebe		1	4		X
Brewer's Blackbird		1			X
Bullock's Oriole	1	2			X
Bushtit	2	3	3	X	X
California Towhee	4	3	3	X	X
Canyon Wren	4		1		X
California Quail	3	3	3	X	X
California Thrasher	3	2		X	X
Cassin's Vireo			0		X
Cliff Swallow	1	1			X
Cooper's Hawk	1	4	1		X
Costa's Hummingbird	1		1		X
Common Poorwill		2			X
Common Raven	2	1	1		X
Downy Woodpecker		1	1	X	X
European Starling		1	1	X	X

¹ CH= chaparral, PO= Pine-oak woodland, and RW= riparian woodland.

² Season of the year that each species was detected, whether in the winter (W) or during the breeding season (Br., effectively spring and summer).

Species	Habitat ¹			Season Detected ²	
	CH	PO	RW	W	Br.
Fox Sparrow		5	5	X	
Golden-crowned Kinglet			5	X	
Golden-crowned Sparrow	5	5	5	X	
Great Horned Owl		4			X
Greater Roadrunner			1		
Hairy Woodpecker		1	1	X	X
Hermit Thrush	5		5	X	
House Finch	1	1	3	X	X
Hooded Warbler	0				X
House Sparrow		1			X
House Wren	4	4	4		X
Hutton's Vireo	2	3	3	X	X
Killdeer			1		X
Lawrence's Goldfinch	1		2		X
Lark Sparrow			1		X
Lazuli Bunting			1		X
Lesser Goldfinch	2	2	4	X	X
Lewis' Woodpecker		1			X
Mourning Dove	3	3	3		X
Mountain Quail	1				X
Northern Mockingbird		1			X
Northern Pygmy-owl		1			X
Northern Rough-winged Swallow	1				X
Nuttall's Woodpecker	1	2	3	X	X
Oak Titmouse	2	3	3	X	X
Orange-crowned Warbler	1	2	2		X
Oregon Junco	2	2	2	X	X
Olive-sided Flycatcher	1	2			X
Phainopepla	2	2	1		X
Pine Siskin		5		X	
Prairie Falcon	4				X
Pacific-slope Flycatcher	1	1	3		X
Purple Finch	1	2	2		X
Pygmy Nuthatch	1				X
Red-breasted Sapsucker	5		5	X	
Red-shafted Flicker	1	2	2	X	X
Red-tailed Hawk	2	2	2		X
Rock Dove			1		X
Rock Wren			1	X	X
Ruby-crowned Kinglet		5	5	X	
Rufous-crowned Sparrow	1	1		X	X
Sage Sparrow	2	1	1		X

Species	Habitat ¹			Season Detected ²	
	CH	PO	RW	W	Br.
Say's Phoebe	4	4			X
Sharp-shinned Hawk		5		X	
Song Sparrow	2	1	4	X	X
Spotted Towhee	3	4	3	X	X
Steller's Jay		1	4	X	X
Swainson's Thrush			0		X
Turkey Vulture	1		1		X
Violet-green Swallow	1	1	4		X
Warbling Vireo	2	2	4		X
Western Bluebird	1	4	2		X
Western Kingbird	1	2	2		X
Western Meadowlark		1			X
Western Scrub-jay	4	4	4	X	X
Western Tanager		0	0		X
Western Wood-pewee	1	4	3		X
White-breasted Nuthatch		4	2	X	X
White-crowned Sparrow		5		X	
Wilson's Warbler	0		0		X
Winter Wren			5	X	
Wrentit	4	3	3	X	X
White-throated Swift	4	1	1		X
Yellow Warbler			1		X
Yellow-breasted Chat	1		3		X
Yellow-billed Magpie		1	1	X	X
Yellow-rumped Warbler	5	5	5	X	

Appendix C. Site descriptions for point count and area search plots (where available).

POINT COUNT TRANSECTS

Grassy Canyon (GRCA) point count transect

Follow dirt road from paved park Rd. Go through gate. Follow Rd. to creek crossing, park there.

01- From where you park (cross creek) follow Rd for approx. 110m Flag is on N. side in live Oak.

02- Continue up Rd. Flag is on S. side of in a Live oak about 3m off Rd.

03- Continue up Rd. cross over fence stay on Rd. Point is in a stand of burt gray pines among others, flag is near large broken Pine.

04- Continue up trail, you will come to a Y in the Rd stay R or E Continue up flag is on the SW side of Rd in a Live Oak close to the Rd.

05- Continue up Rd. Fag is NE side of Rd. just before Red and white stake next to the rd.

06- Now that you have walked up here, turn around and head back towards the car. when you come to the creek crossing follow the W. bank S. The creek bends W. follow it to a small Live oak Near a very large Valley Oak flag is in the small Live Oak.

07- Now backtrack and head upstream past the crossing it will make a sharp bend W. @ that corner is a group willows, flag is there on the north side.

Appendix C. Site descriptions for point count and area search plots (where available).

McCabe Canyon (MCCA) point count transect

01 - Do first point where you park by the big gray pine.

02 - Under very large valley oak toward the west edge of the floodplain. One dead and one nearby live limb are both flagged on the south edge of the tree.

03 - (230-240m from 02) At live oak (medium sized, >5m tall and not too bushy) with small gray pine right next to it to the west. Oak is in the middle of the bed, but more toward the east edge. Stand on the east side of the flagged oak.

04 - At a big patch of yerba santa type shrub toward the east edge of the creek bed - creek bed is fairly broad at this point (about 25m across). There is a large manzanita up the slope to the east and a smallish bushy live oak straight ahead (about north) and a small gray pine to the west. Yerba forb is flagged.

05 - At a small live oak on the east side of the creek bed just past a couple of very decayed logs. Across the bed from a group of three oaks, just where the canyon is about to start narrowing. The decaying log and oak are flagged.

06 - On the east edge at a live oak that's on the east edge of the creek bed. You'll be able to see a significant side drainage that leads off up to the north/east. If you are standing in the right spot the east edge is flagged (at point) and also flagged is the west side of the creek bed in case you are walking in the bed and can't see the side drain from there.

07 - Walking up drainage - as you get to about 50m from a dead and decaying pine laying across the bottom of the drainage look to your left (west) for a chamise between 2 oaks just past a gray pine. The chamise is flagged.

08 - At a large gray pine whose main trunk splits into three trunks has burn scars and lots of dried sap. Branch hanging down to west side of tree is flagged.

09 - Smallish buckwheat flagged before 10 - just after a couple of live oaks on the east hillside and a gray pine and live oak in bottom of creek bed. In middle /bottom of creek bed, just before 2 drainages converge.

10 - At park boundary. Chamise flagged red/black. On left side of drainage, next to small, white park boundary sign.

Appendix C. Site descriptions for point count and area search plots (where available).**North Chalone Peak (NCPE) point count transect**

01 - in the lovely meadow (first open area, not really a meadow, but it is lovely) at saddle between N. and S. Chalone Peaks. Blue/yellow

02 - Contour along the north slope/side of the valley that heads north/east (opposite of the contoured trail). Head straight north first - to get through the ceanothus. You'll walk across the mostly bare/rocky area toward the gray pine. Pass the gray pine and skirt the top edge of the chaparral until you get to the flagged ceanothus. Red & black

03 - Go back down a few bushes to a good path through the veg - continue east skirt through rocks - go upslope to find path through veg and continue towards brown rocks and pines. Go through the pines and around the rocks. Point 3 is on the east side of the lichen covered rocks. Small gray pine is flagged. Point is at rock just south/west of the flagged pine (surrounded by sticky monkey flower.). Red/black

04 - Continue about 220m - across a fairly steep draw - may have to go upslope to cross better -* don't go up to big rocks, too much dense chamise to cross again. Just on other side of draw point is at gray pine just west of a large rock which is about as far as you can go down before having to seriously bushwack. Red/black

No point 5.

06 - 510m (GPS) uphill/up trail from point 1 as you're heading up to N. Chalone Peak; next to 2 junipers. Flag in juniper. Blue/yellow

07 - further north up trail, at south end of oak patch. In blue oak. Yellow/blue

08 - continue up trail (northward), flagging on oak is not for actual point but instead is the marker (GPS: 8A) which tells you when to get off the trail. the actual point (8) is not yet marked; drop 25m straight downhill to actual point amidst oaks

09 - continuing on main trail (you do not go up the final trail to the peak itself), it is just off trail to west in oak patch

Appendix C. Site descriptions for point count and area search plots (where available).

North Wilderness Trail 1 (NWTR) point count transect

The North Wilderness Trail transect follows the trail by the same name starting about ½ mile past the trailhead. It goes through oak savanna and chamise chaparral habitat. When the trail cuts left (north), continue west along an older trail up some steep hills. Points are about 250m apart.

1. Point 1 is about 50 meters up from a large boulder on the west side of the trail. It is next to a large blue oak on the left (east) – the point is marked on the south side of the tree.
2. Point 2 is on the trail next to a large coast live oak on the right (E). A largish, white-tipped rock is on your left (W).
3. Point 3 is about 15 meters east of the trail, next to a sapling blue oak, just before the woodland ends.
4. Where the trail bends right, a few blue oaks are on the left.
5. The chamise gets pretty tall (overhead, at least if you're 5'10"). Point is on the west side of the trail, near a large live oak, 10 meters before a grey pine.
6. Point 6 is in chamise, 20m before top of hill, on the west side of the trail in a small pullout.
7. Point 7 is 15m from the top of the next hill, in a small pullout on the west side of the trail.
8. Keep going up... Point 7 is on top of the next hill, on the back side of a alonge chamise bush on the east side of the trail.
9. OK, now you start going down hill. Point 9 is on the left (west) in a small pullout in the chamise.
10. Go downhill some more. Point 10 is about 30 meters past a grey pine, on the ridge saddle.
11. Point 11 is 15 meters before the sign for the North Wilderness Trail turn (North). The point is on the south side of the trail in a small pullout.
12. Go straight past the trail turn on an older (jeep?) trail, up a steep hill. Pass one old metal stake, and the point is at the second metal stake along the trail.
13. Keep along this trail, up a steep hill, around some chamise blocking the path. Point 13 is about 15m after that.
14. You've reached the last point! To get there, keep on the trail up another steep hill to where the trail Ts. This is point 14 – there is a metal stake on the north side of the trail.

Appendix C. Site descriptions for point count and area search plots (where available).

North Wilderness Trail 2 (NOTR)

This transect, originally dubbed “North Trail”, is also along the North Wilderness Trail, but starts along an old trail and crosses the NWTR transect. To get there, hike along the north wilderness trail until you see a spot on your left where an old trail has been covered over with dead branches. Cut in here and follow the old trail to a nice big oak savanna. This is a good place to camp. The transect starts about 100 meters past this savanna, following the old trail. There are only 10 points because it ends up meeting the WFCC transect.

1. On the old trail, past the first oak savanna patch, past the second small opening with trees, on the north side of the trail, on the southwest side of small opening in chaparral.
2. You come to the real north wilderness trail and keep straight – now you are on the real trail (and you have just crossed over the NWTR transect). Go downhill. The point is at the end of a level spot 10 meters before a very small blue oak that you must duck under.
3. Continue downhill, turn east along the trail and you get to a poison oak copse. Point 3 is here, just past (about 2m) a blue oak with a grey pine leaning on it.
4. Go through the corridor of mountain mahogany and blue oaks. Point 4 is 10-15m before the last 2 blue oaks (last 2 for a little bit, at least), on the east side in some mountain mahogany.
5. Point 5 is just before the chamise starts on both sides of the trail.
6. Keep going downhill, and cross two dry washes. Point 6 is next to a 6 ft high snag on the north side of the trail (flag in chamise).
7. Continue on – you are following the creek bed. Pass a grey pine, the point is next to a cairn and a coast live oak on the north side of the trail. There is a large buckeye on the hillside south of the trail.
8. Keep along the trail. Point 8 is in a chamise pullout, just past a wide spot, in an area where the woodland habitat narrows. There is a copse of coast live oak on the north side of the trail.
9. Stay along the path until you get to an open meadow spot. Point 9 is on the east edge of the trees, on the west side of the meadow about 10m off the trail.
10. Point 10 is south of the trail, about 5m off next to a holly-leaved cherry. There is a dead log and a snag about 3m east of the point.

Appendix C. Site descriptions for point count and area search plots (where available).**South Chalone Peak (SCPE) point count transect**

Note: points are set up starting from 10. Points 10-5 are setup. From the trail from N. Chalone Peak to S. Chalone Peak, head down to bottom of saddle, and continue on the "unmaintained" (actually fairly well maintained) trail southward and uphill up S. Chalone.

- SCPE10 is up from saddle a ways (approx 250m+ GPS-wise), on trail
- SCPE09: continue south from 10, on trail, ceonothus, next to pine
- SCPE08: continue south on trail, point is on trail near juniper
- SCPE07: continue south on trail, point is on trail on ceonothus
- SCPE06: continue south on trail, point is by big juniper and lone gray pine? about at top of S. Chalone Peak

Points 1-5: continue southish, following GPS unit to MIDSCP (GPS name; Midpoint of South Chalone Peak transect), the trail dissipates but the going is easy. MIDSCP is along pig fence, at crossable spot.

- SCPE05: from MIDSCP (fence) go approximately due south to the point in chamise, about 50m.
- SCPE04: from pt 5, countour around to the east and a bit downslope. Point is flagged on chamise just below rock outcropping
- SCPE03: Continue along same basic countour, can walk up through the rocks and over to the pine, then head back down around the rocks, then towards the next bigish pine just past a boulder. Point is at the top edge of the boulder. Low growing buckwheat is flagged.
- SCPE02: Continue on around toward and past the next set of pines at the same basic countour - cross back over pig fence and continue around to N/E facing slope and continue towards dense patch of pines. You weave in and out of dense veg after you pass dead and decaying log that is straight N/E of the first (?) junipers you get to. Pass another downed tree between a small pine and juniper. Point is at the small scrub oak(?) just below the juniper. There's a small gray pine to your left and a large one to your right as you face downslope. Small pine, sage and scrub oak are all flagged, as are numerous other plants on your way in to this point.
- SCPE01: Walk back out the way you came, straight up rocks to top, then follow along near pig fence for probably easiest walking. When slope levels out and you get to the rock with the gray pine growing out near it's base, continue on another ~ 20 m and look for the completely dead & bare pine to the north & down slope a bit (with other rock of similar size on the other side of pig fence, look for the small dead pine. Head straight downslope. Point is at the dead, downed juniper just below the live one.

Appendix C. Site descriptions for point count and area search plots (where available).

South Wilderness Trail (SWTR) point count transect

These points are along the riparian area of the South Wilderness Trail, accessed from the east side of the park. Points are approximately 250m apart.

1. About ¼ mile from the trailhead, where the path begins to diverge from the creek bed. Point is between two coast live oaks 50m before left turn in trail.
2. A fallen tree diverts the path; go around it, into an area with burned pines and oaks. The point is about 10 m past this, just off the trail (east side).
3. You come to an open, grassy area. The point is on the east side of the trail between two huge sycamores, next to a sapling coast live oak.
4. Cross the creek two times. The point is by a large rock by the creek, just before the scramble up out of the creek bed. Hummers like to come drink here.
5. Point 5 is on the east side of the trail in a coast live oak patch, across from burned blue oak woodland/chamise.
6. Go past the old fence (may have to open the wire gate, or it may be open). The trail opens up into the creek bed, and the point is on the southeast side, marked on an arroyo willow bush next to a rock cairn.
7. To find this point, follow the trail past a cairn along a long stretch of sandy creek bed. Point 7 is on the west side of the trail next to an arroyo willow.
8. Point 8 is on the east side of the trail next to a large, long sycamore tree, about 10m off the trail, just before you go uphill past a bunch of buckeye.
9. Follow the trail over the hill and around the bend. Point 9 is off the east side of the trail, by the riparian, next to a buck brush (Ceanothus), about 10m before a grey pine.
10. The trail cuts up from the riparian area and into chamise scrub. At the end of the row of chamise, about 20 meters before the sturdy pig fence, cut east: point 10 is off the east side of the trail next to a young coast live oak.
11. It is where the trail ends and the terrain becomes very steep. The point is between an elderberry bush and the fenceline... to get there, just follow the pig fence until arrive. There is a large coast live oak northwest of the point.

Appendix C. Site descriptions for point count and area search plots (where available).**Upper Chalone (UPCH) point count transect**

The Confluence: about 100 meters further south from UC#7 is the confluence between the two creeks; heading northwest from confluence (marked UCCONF on GPS) will be the second transect along the creek; at north end of this creek (where it hits the newly acquired land) is the blue oak area Amy was telling us about and encouraging us to transect

NOTE: UPCH#4-7 are along creek, south from point 1. i.e., coming from south, you would hit 7, 6, 5, 4, 1, 2, 3, and then the other points (8 onward) in the chaparral along the dozer line

UPCH07 - southward along creek from point 6; on interior live oak

UPCH06 - west side of creek, continuing south along creek from point 5

UPCH05 - 250m southward along creek from 4

UPCH04 - 250m southward along creek from UPCH01

UPCH01 - follow trail downstream along creek (southward), point is on east side of creek, on ceonothus

UPCH02 - upstream of trail crew tent area

UPCH03 - go up dozer trail, at flagged point (3A in GPS) go south approximately 40 m (03 in GPS)

UPCH08 (changed from UPCH0A)- Continue on dozer trail, down to right to small narrow drainage-Cross drainage to open wide grassy trail.. (non-chamise) bush is flagged on the left side.

UPCH09 (changed from UPCH0B)- Continue on this trail until it becomes bare of veg. and starts climbing, Chamise flagged.

UPCH10 (changed from UPCH0C)- Uphill 200m until flagged chamise.

UPCH11 (changed from UPCH0D)- ?

UPCH12 (changed from UPCH0E)- Up over hill, keep going up until chamise partly blocking path is flagged.

Appendix C. Site descriptions for point count and area search plots (where available).

West Fork Upper Chalone (WFCC) point count transect

- 01- From Confluence (camp) approx. 200m up main trail on w. side of creek. Point is next to rock Cairn.
- 02- Stay on trail proceed approx. 250m again point is next to rock cairn.
- 03- Up trail. approx. 250m , Flag is on a small gray pine on old creek bed.
- 04- 250m up trail near large gray pine in an interior live oak.
- 05- 250m up trail flag is near creek.
- 06- 250m up trail, trail crosses creek near large Int. Live Oak.
- 07- continue up trail cross creek proceed to just before next crossing, flag is near large gray pine.
- 08- Continue up trail. 250m go under fallen gray pine flag is in willow just after.
- 09- Stay on trail, continue 250m point is above creek cut-bank.
- 10- Continue up trail 250m to just downstream from confluence, cross creek, flag is in Interior Live Oak.

* Should you get lost return to last point, start over, stay on trail and look for orange flagging.

Appendix C. Site descriptions for point count and area search plots (where available).

AREA SEARCH PLOTS

Bear Gulch (BEGU) Area Search Plots

Plot boundary information unavailable – plot not established for long-term monitoring.

Grassy Canyon (GRCA) Area Search Plots

Plot A

Plot A begins with pt. 1 (GRCAA)

Plot A ends about 70m past gate, just near old fence post (red & white stake). 15 m before PC #3.

Plot B

Begin Plot B at end of Plot A (GRCAAB)

End Plot B 75 m past PC #4 (GRCABC)

Flagging in small Live Oak (shrub or small tree), SE right next to road.

Plot C

Start Plot C at end of Plot B (Do not follow pt. cnt. directions – continue up road)

End Plot C 50 m past red & white US Park Boundary sign, on right of road (not sign near PC #5 on tree)

McCabe Canyon (MCCA) Area Search Plots

Plot A

Begin Plot A at point MCCA01. End Plot A (MCCAB) – blue flagging on young coast/interior live oak (3.5 m tall), on right side of path on very west end of floodplain @ bottom of slope (across from large oak on left side of path)

Plot B

Begin Plot B (MCCAB) at end of plot A. Plot B ends ~ 25 m after PC #4 (MCCA04). ~ 45 m east of 2 huge gray pines in 'A' shape. Blue flag in coast/interior live oak. (2nd oak after flag in shrub for PC #4, on east side of flood plain)

Plot C

Plot C (MCCAC) begins ~ 25 m after PC #4 (MCCA04), at end of Plot B

Plot C ends ~ 20 m past PC #6 (MCCA06). Marked large oak on rt. (E) side of creek bed w/blue flag.

Plot D

Begin Plot D (MCCAD) at end of Plot C.

Plot D (called MCCA08 in GPS) ends ~ 40 m past PC #8 (MCCA08). Blue flag in huge dead gray pine w/ curved branches (laying on ground). On west side of creek bed.

Appendix C. Site descriptions for point count and area search plots (where available).

North Chalone Peak (NCPE) Area Search Plots

Plot boundary information unavailable.

South Chalone Peak (SCPE) Area Search Plots

Plot A

Plot boundary information unavailable.

Plot B

Begin @ rock outcrop off north side of peak (UTMs 10 S 0662584, 4034126). Plot runs along fence downhill. Plot is linear, following fence and counting to 25 meters on both sides of fence.

End @ saddle at the bottom of the hill (UTMs 10 S 0661994, 4034281).

Plot C

Plot boundary information unavailable.

Upper Chalone Creek (UPCH) Area Search Plots

Plot A

Begin Plot A at 1st pt on transect (PC #7)

End Plot A 100 m past PC #6 (this is also beginning of Plot B)

Plot B

Begin Plot B 100m past PC #6. Blue flagging in large, forked (2 trunks) Gray Pine – mostly dead lower branches on east (right) side of creek bank, just before cross dry creek bed.

End Plot B at PC #4. Blue & yellow flagging in medium (2 trunks) oak, on east (right) side of creek bed when heading north on transect. (Theres a 2nd oak directly behind marked one.)

Plot C

Begin Plot C at end of Plot B (see description above)

End Plot C 50 m beyond PC #1. Marked w/ blue flag in bushy live oak on east side (if heading North) of creek bed. Dead, fallen tree behind oak.

West Entrance (WEEN) Area Search Plots

Plot boundary information unavailable – plot not established for long-term monitoring.

West Fork Chalone Creek (WFCC) Area Search Plots

Plot boundary information unavailable.